

MTH601

Assignment #02

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Question:

A manager needs to efficiently allocate four different jobs to four workers in order to minimize the total man-hours spent on the tasks. The times taken by each worker to complete each job are provided in the

table below:

Jobs	Workers			
	A	B	C	D
1	10	20	18	14
2	15	25	9	25
3	30	19	17	12
4	19	24	20	10

By using the Hungarian Algorithm determine the optimal assignment of tasks to workers in a way that minimizes the total man-hours.

Solution:

Number of rows = Number of column = 4

	A	B	C	D
1	10	20	18	14
2	15	25	9	25
3	30	19	17	12
4	19	24	20	10

Here the problem is Balanced.

Step-1: Find out the each row minimum element and subtract it from that row.

	A	B	C	D	
1	0	10	8	4	(-10)
2	6	16	0	16	(-9)
3	18	7	5	0	(-12)
4	9	14	10	0	(-10)

Step-2: Find out the each column minimum element and subtract it from that column.

	A	B	C	D
1	0	3	8	4
2	6	9	0	16
3	18	0	5	0
4	9	7	10	0
	(-0)	(-7)	(-0)	(-0)

Iteration 1:

Step-3: Make an Assignment in Opportunity cost table:

- Identify rows with exactly one unmarked 0. Make an assignment to this single 0 by make a square ([0]) around it and cross off all other 0 in the same column.
- Identify columns with exactly one unmarked 0. Make an assignment to this single 0 by make a square ([0]) around it and cross off all other 0 in the same rows.
- If a row and/or column has two or more unmarked 0 and one cannot be chosen by inspection, then choose the cell arbitrarily.
- Continue this process until all 0 in rows/columns are either assigned or cross off(0).

Row-wise & column-wise assignment shown in table:

	A	B	C	D

1	[0]	3	8	4
2	6	9	[0]	16
3	18	[0]	5	0X
4	9	7	10	[0]

Step-4: Number of assignments = 4, number of rows = 4
Which is equal, so solution is optimal

Optimal assignments are:

	A	B	C	D
1	[0]	3	8	4
2	6	9	[0]	16
3	18	[0]	5	0X
4	9	7	10	[0]

Optimal Solution is:

Jobs	Workers	Time In hours
1	A	10
2	B	9
3	C	19
4	D	10

So,

The Minimum Total hours = 10+9+19+10 = 48.